CLAIMS

1. An apparatus comprising:

a substrate made of a semiconducting material; and

a plurality of sections on said substrate, all said sections being connected together, at least two of said sections being resonators, each including a waveguide system and having spaced resonant maxima points providing a maximum resonance with an associated wavelength,

wherein the spacing of at least two of said resonant maxima points of the respective sections being essentially not equal, and at least one of said resonant maxima of each of two said sections being resonators overlapping each other.

2. The apparatus as recited in claim 1, wherein only one of said resonant maxima of each of said sections being resonators overlapping each other.

3. The apparatus as recited in claim 1 or 2, wherein said resonator is either a transmission filter having spaced transmission maxima points providing a maximum transmission with an associated wavelength as resonant maxima points or a reflector having spaced reflective maxima points providing a maximum reflection with an associated wavelength as resonant maxima points.

4. The apparatus as recited in claim 3, further comprising a two-sided active radiation-generating section on said substrate, said plurality of sections being connected to one side of said two-sided active section.

5. The apparatus as recited in claim 4, wherein at least one of said plurality of sections is inactive.

6. The apparatus as recited in claim 5, wherein at least one of said plurality of sections is active.

7. The apparatus as recited in claim 6, wherein at least one of said waveguide systems has a periodically broken short-period structure including short period stripped regions alternating with non-stripped regions.

8. The apparatus as recited in claim 7, wherein at least one of said waveguide systems has a diffractive grating having a plurality of repeating unit regions each having a constant length, thus forming a modulation period, and at least one parameter that determines the optical reflectivity or transmission of said diffractive grating varying depending on its position in each of said repeating unit regions along a direction of optical transmission in said laser, said diffractive grating extending by at least two modulation periods.

9. The apparatus as recited in claim 8, wherein at least one of said waveguide systems is a ring resonator.

10. The apparatus as recited in claim 9, wherein said active section is creating a light beam by spontaneous emission over a bandwidth around one center frequency and guiding said light beam and having optical amplification actions.

11. The apparatus as recited in claim 10, wherein the combination of said plurality of sections has a combined reflection action and said optical amplification action of said active section causing lasing at at least one of the reflection wavelengths of said combination.

12. The apparatus as recited in claim 11, further comprising a plurality of power splitters, being

used for connecting some of said plurality of sections and connecting to said active section.

13. The apparatus as recited in claim 12 wherein said apparatus is a serial concatenation of said active section and a plurality of said sections.

14. The apparatus as recited in claim 12, wherein a connection of said active section is performed to one single port side of a power splitter with a parallel connection of a plurality of sections to the other multi port side of said power splitter.

15. The apparatus as recited in claim 14, further comprising a plurality of phase sections, being used for adjusting the round trip cavity phase.

16. The apparatus as recited in claim 15, further comprising means for injecting current into at least some of said sections being a resonator in order to have said transmission or reflection characteristic being shifted in wavelength.

17. A method for setting lasing frequencies of an apparatus, the apparatus comprising a substrate made of semiconducting material, a plurality of connected sections on said substrate, with at least two of said sections, being resonators having spaced resonant maxima points providing a maximum resonance with an associated wavelength, wherein the spacing of at least two of said resonant maxima points of the respective sections being essentially not equal, said method comprising the step of:

positioning said resonant maxima points of said resonators such that a plurality of said resonant maxima of each of said sections being resonators overlapping each other, said plurality defining said lasing frequencies.

18. A method for changing the lasing frequency of an apparatus as recited in claim 1 from a

first frequency to a second frequency, said second frequency being spaced from said first frequency by a first distance, said apparatus comprising a substrate made of semiconducting material, a plurality of connected sections on said substrate, with at least two of said sections, being resonators, having spaced resonant maxima points providing a maximum resonance with an associated wavelength, wherein the spacing of at least two of said resonant maxima points of the respective sections being essentially not equal, said method comprising the step of changing the relative position of said resonant maxima points of said resonators with a second distance, being substantially smaller than said first distance.

19. The apparatus as recited in claim 4, wherein the apparatus is used as an integrated/semiconductor tunable optical laser.